

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
30 September 2004 (30.09.2004)

PCT

(10) International Publication Number
WO 2004/084367 A1

(51) International Patent Classification⁷: H01T 13/20,
13/39 // B23K 20/08

(21) International Application Number:
PCT/FI2004/050025

(22) International Filing Date: 10 March 2004 (10.03.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
20030401 18 March 2003 (18.03.2003) FI

(71) Applicant (for all designated States except US): WÄRT-
SILÄ FINLAND OY [FI/FI]; Tarhaajantie 2, FI-65380
Vaasa (FI).

(72) Inventors; and

(75) Inventors/Applicants (for US only): LINTULA, Pekka

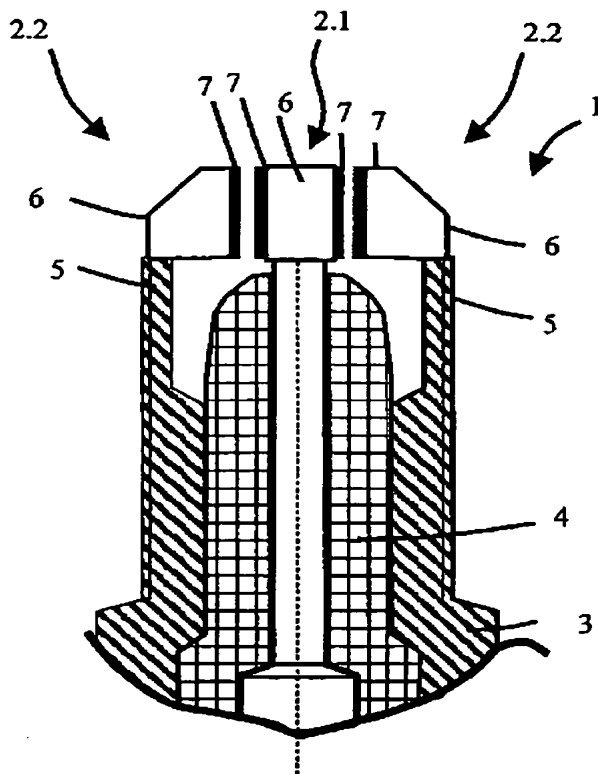
[FI/FI]; Vuoresojantie 71, FI-33850 Tampere (FI). TASK-
INEN, Kalevi [FI/FI]; Kattilaistentie 6, FI-33960 Pirkkala
(FI). LINTUNEN, Pertti [FI/FI]; Kaaponkuja 5 D 10,
FI-33820 Tampere (FI). SILVONEN, Aulis [FI/FI]; Huvi-
latie 28 as. 2, FI-65230 Vaasa (FI). LINDROOS, Tomi
[FI/FI]; Iisakinrinne 5, FI-37560 Lempäälä (FI).

(74) Agent: AWEK INDUSTRIAL PATENTS LTD OY; P.O.
Box 230, FI-00101 Helsinki (FI).

(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN,
CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI,
GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,
KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD,
MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG,
PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM,
TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM,
ZW.

[Continued on next page]

(54) Title: SPARK PLUG AND METHOD FOR PRODUCING IT



(57) Abstract: A spark plug (1) for an internal com-
bustion engine, the spark plug having at least two elec-
trodes, in which the electrode (2.1, 2.2) are formed of
a first part (5) made of a substrate material and a sur-
face part (7) more durable than the substrate material.
The surface part (7) of the spark plug is joined to the
first part via an intermediate part (6) making use of ex-
plosion welding. The method also relates to a method
for producing a spark plug (1) for an internal combus-
tion engine, the spark plug having at least two electrodes
(2.1, 2.2).

WO 2004/084367 A1

Best Available Copy



(84) **Designated States** (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Published:

— *with international search report*

Best Available Copy

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 2004/050025

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H01T 13/20, H01T 13/39 // B23K 20/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: H01T, B23K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2391455 A (F.R. HENSEL), 25 December 1945 (25.12.1945), column 1, line 34 - line 38, figure 3 --	1-8
A	EP 0817342 A1 (NGK SPARK PLUG CO., LTD), 7 January 1998 (07.01.1998), column 2, line 3 - line 51; column 4, line 52 - column 5, line 3, figure 1 --	1-8
A	EP 0903824 A1 (NGK SPARK PLUG CO. LTD.), 24 March 1999 (24.03.1999), abstract --	1-8

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search

6 July 2004

Date of mailing of the international search report

16 -07- 2004

Name and mailing address of the ISA/
Swedish Patent Office
Box 5055, S-102 42 STOCKHOLM
Facsimile No. +46 8 666 02 86

Authorized officer

Tomas Erlandsson/MN
Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 2004/050025

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 1047513 A (E.I. DU PONT DE NEMOURS & COMPANY), 19 April 1963 (19.04.1963), page 2, line 44 - line 48 --	1-8
A	US 5323955 A (OSWALD R. BERGMANN ET AL), 28 June 1994 (28.06.1994), column 1, line 14 - line 34; column 5, line 44 - line 50 -- -----	1-8

Best Available Copy

INTERNATIONAL SEARCH REPORT
Information on patent family members

30/04/2004

International application No.
PCT/FI 2004/050025

US	2391455	A	25/12/1945	NONE		
EP	0817342	A1	07/01/1998	DE	69703067 D,T	01/02/2001
				JP	10022052 A	23/01/1998
				US	5894186 A	13/04/1999
EP	0903824	A1	24/03/1999	DE	69800364 D,T	22/02/2001
				JP	11097151 A	09/04/1999
				US	6166479 A	26/12/2000
GB	1047513	A	19/04/1963	NONE		
US	5323955	A	28/06/1994	DE	69313828 D,T	02/04/1998
				EP	0625934 A,B	30/11/1994
				US	5226579 A	13/07/1993
				US	5400945 A	28/03/1995
				WO	9315869 A	19/08/1993

Best Available Copy